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## Sleepiness in a Population of Italian Shift-work Policemen

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### Introduction

Various studies have shown that sleep disorders and daytime sleepiness are the more frequent disturbances reported by shift-workers (1,2). Shift-work interferes with both the quality and quantity of sleep. Concerning the duration of sleep, there is a decrease in the number of hours of sleep both during morning shifts, due to early awakening, and during night shifts due to the inversion of the normal sleep-wake cycle (3). The increase in body temperature, observed starting from the early morning hours, and the unfavorable environmental conditions (noise, family and social life, etc.) make it more difficult to fall asleep during the day (4,5). Data reported in the literature show how sleepiness and fatigue can increase the risk of human errors and accidents (6,7). Night work and loss of sleep may account for some recent serious accidents (Three-Mile Island 1979, Chernobyl 1986, Exxon Valdez 1989).

The consequences of an altered sleep quality, with possible reductions in vigilance levels, seem to be particularly relevant when shift-work is associated with tasks requiring high performance levels and involving stressing working conditions. This situation is constantly present in Police Force personnel, a working group scarcely taken into consideration by international literature (8,9). The aim of our work has been to evaluate, with an assisted questionnaire, the prevalence of daytime sleepiness and the possible relationship between sleepiness and intrinsic sleep disorders and/or sleep disturbances due to the shift-work condition in the overall

population of shift-workers policemen of the town of Genoa.

### Subjects

This study covers the period from September 1996 to February 1997. According to the October 1996 census, the city of Genoa has a population of 653,000 inhabitants and is ranked third as to crime rate in Italy (10). The subjects enrolled in this study were informed on the objectives and methods used during the investigation. The investigation was carried out using a self-administered questionnaire; complete confidentiality was guaranteed during data collection and processing. The subjects were also given telephone numbers where they could get information in case of doubts (the physician in charge of the investigation was available), should the wording of any of the questions be unclear or should its meaning be ambiguous. We have evaluated the questionnaires obtained from 504 male shift-workers (M) and 101 female shift-workers (S), mean age 30 +/- 5 yrs.

The sample of shift-workers included personnel employed in tasks which are generally considered stressful from a psychophysical point of view; such evaluation is based on the content of tasks entailing risks (escort service, patrol service, flying squad, etc.). They were all working fast rotating shifts organized according to the following plan: 1st Evening, 19:00-01:00 h; 2nd Afternoon, 13:00-19:00 h; 3rd Morning, 07:00-13:00 h; 4th Night, 01:00-07:00 h; 5th Rest. Furthermore, special operational

requirements could entail an extension of the working period without an immediate recovery.

### Questionnaire

The identification of subjects with pathological sleepiness was assessed using a subjective evaluation scale (Epworth Sleepiness Scale, ESS, Murray WJ 1991) (11) translated into Italian by the authors. The scale measures the tendency to sleep in different daily life situations. It has been validated in normal subjects and in patients suffering from different diseases leading to daytime sleepiness and has shown good discriminating sensitivity and excellent correlation with the results obtained with objective neurophysiological procedures (12).

In a second step, in order to evaluate the presence of sleep disorders in this subgroup of shift-workers, all the subjects with an ESS scores greater than 11 (a value indicating the first level of pathological sleepiness) underwent a second investigation on sleep disturbances by means of an assisted questionnaire aimed to evaluating the presence of intrinsic sleep disorders.

The questionnaire was subdivided into two groups of questions: the first group included personal-administrative questions on sex, age, civil status, number of children, type of service, role, seniority in shift-work schedules, weight and height. The second group was made up of 13 questions related to sleep and aimed to detect symptoms of narcolepsy (three questions regarding the presence of cataplexy, sleep paralysis and irresistible sleep attacks), obstructive sleep apnea (three questions regarding snoring, nocturnal awakenings with air hunger, nycturia), restless leg syndromes and/or periodic leg movements during sleep (two questions) and difficulties in initiating and maintaining sleep (four questions).

The questions were organized into four ordinal levels "NEVER", "RARELY", "SOMETIMES", "OFTEN" (for instance, *Do you have any difficulty initiating sleep?*, *Do you snore?*, etc.).

Patients were considered positive as to the presence of sleep disturbances only if they responded "sometimes" or "often" to all the items referred to each one of the sleep disturbances explored.

Moreover subjects were asked to respond if they have ever had an accident at work or during driving and if it could be the consequence of excessive sleepiness.

### Statistical analysis

The subjects with pathological sleepiness were divided into two groups: with and without clear symptoms of intrinsic sleep disorders. The distributions of age, seniority and number of accidents were evaluated for each group and the between group differences were assessed by means of the chi-squared test ( $\chi^2$ ). Significance was accepted at  $p < 0.05$ .

### Results

In 61 subjects (9,9% of the population studied) a pathological level of sleepiness was found.

The mean score of the ESS was 12,4 ranging from 11 to 18 (Fig.1).

Subjects positive for symptoms related to intrinsic sleep disorders were 32 (Table 1). Ten subjects were positive to more than one sleep disorder.

The distribution of age and seniority suggested the prevalence of older subjects in the group with clear symptoms of sleep disturbances but the between group differences did not result statistically significant.

25 subjects positive for symptoms of intrinsic sleep disorders and 14 subjects without sleep disorders referred to have had an accident at work or during driving ( $\chi^2$ ,  $p < 0.02$ ). Moreover 11 subjects positive for sleep disorders and only 3 subjects without sleep disorders referred to have had an accident due to excessive sleepiness.

### Discussion

Our investigation revealed a relative high prevalence (9,9 %) of excessive daytime

sleepiness in our sample studied. These data, measured by a standardized method, mirrors the results obtained in other populations of workers (13).

About the 50% of the sample studied had evidence of an intrinsic sleep disorder, even though an accurate diagnosis could not be made by this questionnaire. Subjective reports of sleep habits cannot provide accurate diagnoses to explain excessive daytime sleepiness in terms of sleep disorders. Nevertheless, analysis of the answers to the items of the questionnaires seems to show a high prevalence of sleep disorders that could contribute to shift-workers sleepiness.

A large group of subjects with an ESS scores  $\geq 11$  did not fall within the criteria of any intrinsic sleep disorders investigated. Their daytime sleepiness could be a consequence of other factors such as an insufficient sleep in the 24 hours. This requires further investigation.

Our results revealed a high prevalence of accidents in subjects positive for sleep disturbances. Moreover a third of the sample with associated sleep disturbances referred to have had an accident at work or driving as a consequence of the excessive sleepiness. Only three subjects in the other group of shift-workers responded in the same way. Sleepiness as a consequence of shift-work per se is known to increase the risk of accidents during the working hours. Our data seems to reveal that such a risk is further increased by the association with intrinsic sleep disorders. The risk of accidents at work is much more relevant when shift-workers, that have to guarantee community safety, are engaged in tasks requiring high performance levels and stressing working conditions as in the case of policemen.

In conclusion our data want to alert occupational health physicians to possible lurking intrinsic sleep disorders worsening health problems in shift-workers.

### Bibliography

- 1) Costa G. The impact of shift and night work on health. *Ergonomics* 1996; vol. 27, No. 1: pp. 6-16.

- 2) Kogi K. Sleep problems in night and shift work. *J Human Ergol* 1982; 11 (suppl.): 217-231.
- 3) Rutenfranz J. Occupational health measures for night and shiftworkers. *J Human Ergol* 1982; 11 (suppl.): 67-68.
- 4) Akerstedt T. Psychological and psychophysiological effects of shiftwork. *Scand J Work Environ Health* 1990; 16 (suppl. 1): 67-73.
- 5) Knauth P and Rutenfranz J. 1975. The effects of noise on sleep of shiftworkers. In: Colquhoun WP, Folkard S, Knauth P and Rutenfranz J (eds) *Experimental Studies of Shiftwork*. Westdeutscher, pp. 57-65.
- 6) Leger D. The cost of sleep-related accidents : a report for national commission on sleep disorders research. *Sleep* 1994; 17 (1): 84-93.
- 7) Dinges DF. An overview of sleepiness and accidents. *J Sleep Res* 1995; 4 (suppl. 2): 4-14.
- 8) Phillips B, Magan L, Gerhardstein C, Cecil B. Shift work, sleep quality and worker health: a study of police officer. *Southern Med J* 1991; 84, 10: 1176-1184.
- 9) Garbarino S, Nobili L, Balestra V, Cordelli A, Ferrillo F. Sleep habits in a Italian population of state policemen. Comparison between shift and not shift workers. *Shiftwork Inter Newsletter* 1997; p.50.
- 10) Ministero dell'Interno, Dipartimento di Pubblica Sicurezza, Ufficio per il coordinamento e la pianificazione delle Forze di Polizia. "Andamento della criminalità in Italia 1996". Roma Ist. Poligrafico Zecca dello Stato.
- 11) Murray WJ. A new method for measuring daytime sleepiness. The Epworth Sleepiness Scale. *Sleep* 1991; 14 (6): 540-545.
- 12) Murray WJ. Sleepiness in different situations measured by Epworth Sleepiness Scale. *Sleep* 1994; 17 (8): 703-710.
- 13) Murray J, Hocking B. Daytime sleepiness and sleep habits of Australian workers. *Sleep* 1997; 20 (10): 844-849.

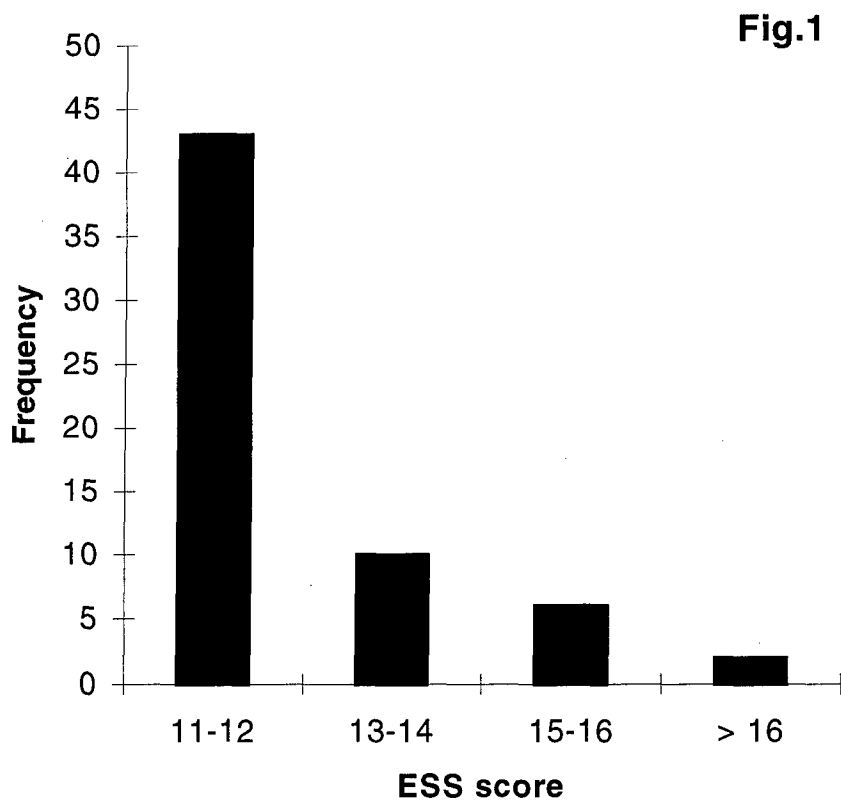


Fig. 1: Frequency distribution of Epworth sleepiness scale.

**Table 1: symptoms of sleep disorders derived from the questionnaire**

Symptoms of sleep disorders	Number of subjects
None	29
Insomnia	10
Insomnia + RLS / PLMS	3
Insomnia + Narcolepsy	1
OSAS	5
OSAS + Insomnia	3
OSAS + RLS-PLMS	1
OSAS + RLS-PLMS +Insomnia	1
OSAS+RLS-PLMS +Narcolepsy	1
RLS-PLMS	5
Narcolepsy	2